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Applying Social Network Analysis to Discover Service Innovation within Agile Service Networks

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The literature indicates that there is urgent need to address the significant gap in our ability to value the contributory interaction of service networks in organisational performance. This paper is primarily concerned with exploring how service (re)configuration is utilised to optimise network performance. The paper will summarise the literature review over the past year in the quest to document how we can understand the contributory value of service innovation networks. It identifies some interesting overlaps in business process management, service science, and network innovation literature. This paper will discuss how failing to account for the value of service networks inhibits our capability to discover and monitor service performance and how this complements the evolvement of service science. This prevents managers from transforming information on network activity and infrastructural capabilities into strategic knowledge. This paper demonstrates how social network analysis (SNA) can be a powerful tool for managers to understand organisational network performance and service interaction.

Key words: service network; service innovation; social network analysis; agile service networks; service discovery
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1. Introduction

Our traditional understandings of the '*organisation*', with solid boundaries and internally focused on operations, time, and individuality are becoming less apparent today. As competitive advantages of single organisational strategies continue to erode over recent years, organisations are experiencing greater demands to operate with increased innovation, collaboration, scalability, efficiency, agility, and virtuality (for example, Zairi, 1997; Morabito, et al., 1999; Rust and Kannan, 2002; Brynjolfsson and Hitt 2003; Afsarmanesh and Camarinha-Matos 2005; Bender-deMoll and McFarland, 2006; Friedman, 2006; Krebs, 2007; Van Oosterhout et al., 2007; Chen, 2007; Glenn, 2009; Hsu, 2009). Organisations must develop new initiatives to operate under these new economic conditions and enhance their competitive edge (Mooney and Ganley, 2007; Glenn, 2009). Information and communication technology (ICT) has been charged as one of the main contributors for organisational "*flattening*" (Friedman, 2006). The information revolution has given birth to new economies structured around dynamic processes and flows of data, information, knowledge, and more recently, people (Handy, 1989, Kanter 1989; Scase and Goffee, 1989; Rubery et al., 2002; Friedman, 2006). Thus, information technology plays a significant role in the enabling or inhibiting of business process behaviour (Weill *et al.*, 2002). Armed with new opportunities,

organisations continue to search for improved methods to maintain equilibria across their organisational efforts. Organisations search for the right balance or requisite variety between '*use, usage, and usability*' (Keen and Sol, 2008) of their resources and processes through service-oriented approaches. On a virtual scale, understanding the value of service networks is proving to be extremely difficult and a daunting task for management. Technology, globalisation, and indeed economics have radically changed the way business is conducted over the last decade. Understanding the value of business processes and technologies contribution towards organisational and economic growth is less clear (qualitatively and quantitatively). Consequently, the use of ICT has altered our understanding of organisational phenomena (Drucker, 1992), i.e., organisational design, structure, manufacturing, and distribution processes of services across the globe. This raises important questions in regard to modern trajectories of organisational service structures and the way in which we value these networks. For example, as organisational networks grow, how can we manage and monitor dispersed business process value?

1.1 **The Study**

With the exponential growth in service systems, understanding their dynamic functionality while exploring methods to manage services is of critical importance within today's business model. Nowadays, the service client is often viewed as a '*value co-producer*', i.e. it is the client that initiates a service process thus it is they whom key to the value creation process (Normann, 2001). On a much wider scale, understanding the value of specific business processes and technological contribution towards organisational and economic growth is less apparent. Modern services are predominately growing due to knowledge-intensive networks rather than being solely manufacturing-orientated. This has profoundly changed the way '*value*' can be created and subsequently managed to propel organisational growth. In order to deliver effective services, providers are being advised to '*innovate*' their service delivery systems. Innovation in this context often refers to technology, technique, or restructuring service network improvements. However, the difficulty is that in the modern organisation, service delivery is dispersed across a complex network of multi-actor systems (i.e. organisations, departments and units). Such complex networked service systems ultimately make service innovations more difficult to understand, manage, or implement. Service innovation requires new strategies, theories, and mechanisms to allow organisations achieve desired business results by optimising the complex factors within service systems. Therefore, it is critical that we investigate how service innovation is managed and what influences innovation within a service environment. Specifically, this research implements and examines the effectiveness of a technique called 'social network analysis' in managing service innovation (re)configuration within network based services.

1.2 **Background**

In 1993, Hammer and Champy advises us to "*forget everything you have known about how business should work – most of it is wrong*". Interestingly, the literature to date up to 2010 coincides that this is largely true as we are beginning to realise that we remain uncertain as to the contributory value of service networks processes within and across organisations (Wellman et al., 1996; Huffman, 1997; Cross and Parker, 2004; Huysman and Wulf, 2006; Lundqvist, 2007; Wang et al., 2007; Van Heck and Vervest, 2007; Sykes et al., 2009; Hassan, 2009). In fact, Normann (2001) challenges Porters goods-dominant *value chain* and suggests that this is no longer relevant to the service-dominant world. Within the service-dominant environment, organisations are under increased pressure to adapt their business processes at a much faster pace than they have ever experienced before (Pedrinaci et al., 2008). Time and quality are two key factored in the deliverance of a service. Managers must be proactive and decisive to embrace change and meet consumer needs (Weill et al., 2002). Thus, strategic management of service technology is essential to reduce the probability of failure (Weill et al., 2002; Brem and Voigt, 2007) as well as the coordination of people within the service system. According to Weill et al., (2002), investing in IT infrastructure is a major challenge for senior managers as many of them are often unprepared to make such decisions. In addition, understanding the value of this infrastructure after huge investment often proves to be an even greater challenge (Carr, 2004). Assessing the value of the IT-enabled business processes is of critical importance as it reveals how an organisation is positioned within a much larger network. Managing business processes (for example, *discovering, monitoring, changing or redesigning*) are essential activities across distributed business applications. According to Brem and Voigt (2007), many companies fail because they cannot manage these fundamental factors successfully.

Gathering data on the health of organisational performance across a large service network is very important. Organisations must attempt to shape and exploit service data, information and knowledge if they want to strengthen their competitive position. One of the major problems, as outlined by Becker (2007), is that managers are faced with a serious issue of how to manage "*a completely invisible asset*". Another problem highlighted by Cross and Parker (2004), is that in the past managers have ignored the '*dynamic characteristics of networks and the ways that*

dynamic qualities of networks affect organisations' flexibility and change' (pp. 133). This has unavoidably led to organisations failing to capture and understanding the 'health' of their service performance, positioning, structure and infrastructural workflows within business processes. Many technologies and business models are incapable of meeting dynamic requirements of today's business world, and appear to employ a continuous 'catch-up' approach, forcing organisations to compensate for technological inadequacies (Orlikowski, 1992; Doherty et al., 2003). The modern business model should present methods to calculate the value of organisational networks (Normann, 2001). One problem appears to include that although the business infrastructure (delivering a service) has changed over the last few decades (service-dominant), the fundamental logic ("back to basics") of running a business has remained quiet static (goods-dominant). Morabito et al., (1999) advocates that it is now time to move from the 19th century organisational model towards a 21st century model. The organisational model has never drastically changed, although information system development continues to accelerate, influence, and alter organisational phenomena. The literature indicates that we must begin to unwrap the underlying principles in dynamic business processes to learn how processes operate and become more efficient (for example, see, Agrawal et al., 1998; zur Mühlen and Rosemann, 2000; Verbeek et al., 2001; Weijters and van der Aalst, 2002; Weijters and van der Aalst, 2003; van der Aalst, 2004; van der Aalst, 2007; van der Aalst et al., 2004; van der Aalst and Hee, 2004, Reijers et al. 2009). In addition, Camarinha-Matos and Afsarmanesh (2007), draw our attention to the need to clearly understand related reference models before we attempt to capture organisational complexity through a new reference model.

2. Literature Review – State of the Art

This section will provide an overview of the state of the art regarding the current business environment. In particular, it focuses on several key theoretical areas which are central to this research: service science, business process management (BPM), agile service networks (ASN), and social network analysis (SNA).

2.1 Introduction – The Business Environment

The business environment had drastically changed over the last decade. Allee (2003) and Galliers (2007), suggests that it is time to realise that we need adequate business models to support organisational growth. Thus, it is apparent that we must steer away from the old traditional business model (goods-dominant), one of which enjoyed individuality, independence, and often focused on internal issues. As organisational practice continues to become more virtualised and reliant on service systems, it is important both in literature and in industry, to understand how we can report the value of service interactions (service-dominant). ICTs have become an integral part of the organisational success strategy. The Internet has emerged as the dominant application platform for businesses to transport business processes and deliver services. Allee (2003), explains how the Internet has enabled a natural network pattern across organisations forming business webs, networks, or economic clusters which increase its influence across service system networks. Thus, service systems continue to facilitate and propel the growth of the '*networked economy'*. This is evident across all sectors of the global economy. According to Papazoglou et al., (2006), services technologies are increasingly helping to shape modern society as a whole, especially areas such as dynamic business, health, education, and government services. Papazoglou et al., (2006) purports that the benefits of applying services technologies, "*reduces complexity and costs, exposing and reusing core business functionality, increased flexibility, resilience to technology shifts and improving operational efficiency*" (p. 3). Allee (2003) adds that exploiting Internet technologies allows businesses to "*deliberately enlarge their business networks, entering into strategic alliances that help expand their brands, strengthen capability, and help distribute products globally*" (p. 8). Capturing this information (business process interaction patterns) can provide manages with vital information on service system health as opposed to traditional historical monetary metrics which were sufficient in a goods-dominant business model. The business process patterns within a service system can provide managers with a thorough insight of the hidden value in service networks. It is at this point, we believe that providing managers with the ability to visualise business process patterns, can reveal interesting strategic value to the operations of an ASN. The introduction of service science, management, engineering, and design (SSMED) is one step to facilitate the management and design of service systems. The concept of SSMED acts as an umbrella term which encapsulates the dynamic business processes across service networks. Figure 1 below illustrates the relationship with SSME, ASN, and how service (re)configuration presents us with the opportunity to model dynamic business processes and innovative processes through the application of SNA.

Figure 1 Overview of Literature Review

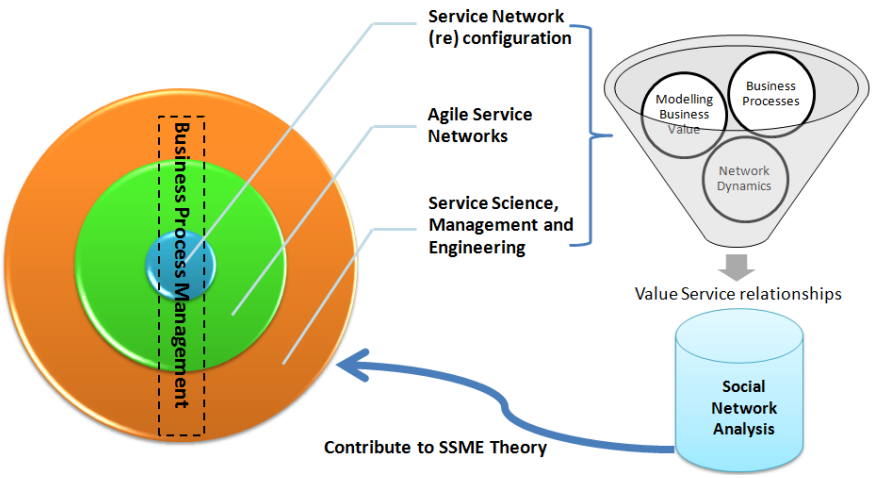

Figure 1 above, depicts the overlap of service network configuration (which incorporates service innovation), ASN, and SSME. It illustrates how we can understand how business processes, business value, and network dynamic through the application of social network analysis. This provides an overview of the research which will be further discussed in the sections to follow.

2.2 The Service Environment

Organisations are beginning to move away from the traditional corporate hub of business practice towards a more diffused and distributed web of relationships and agile alliances. The literature indicates that service innovation play a significant role in the sustainability of organisational growth and development while accentuating the transformation of economic phenomenon as a whole (Miles, 2002). Modern service systems have become very complex. ICT contributes towards organisational "flattening" (Friedman, 2006) which adds to the complexity and evolvement of service science (Chesbrough and Spohrer, 2006). The wealth of information available on people and their roles, technology and processes, and organisations and activity or performance has never been greater, nor has the prospect to (re)configure them into service relationships to create and manage service value. Technological advances continue to act as a driving force for '*making new patterns and a new elevated level of value creation possible'* (Normann, 2001; p. 8). Understanding the value and influences within service innovation networks has become extremely problematic. According to Normann (2001), the logic of value-creation is considered to be horizontal, boundryless, no ties to physical territory, and has a network rather than hierarchical structure (p. 41). It is evident that there is a lack of clear understanding on how service innovation is systematically fostered or managed. As a result, there is little evidence to suggest that managers fully understand or exploit the capabilities of a service which inhibits their ability to truly manage it.

2.2.1 Service Technology

In recent years there has been significant interest in our ability to manage service-oriented architecture (SOA) to govern service systems development and integration. The literature indicates that there are four underlying factors within a service: (1) provision, (2) consumption, (3) description, and (4) brokerage (S-Cube, 2008). We propose the need to add *innovation* as a critical factor of services network which supports the efficient deliverance of service processes. Across academia and industry we are beginning to recognise the significance of service innovation and service systems within the global economy.

2.2.2 Exploring Service Innovation Value

The growth in service science as a discipline has underscored the need to investigate the contributory value of business processes and its influence on which service systems (including people, technology, and organisations) affects the delivery of organisational performance. Within organisational and technological management theory, understanding and measuring value (i.e. "*application of competences*") of service networks is considered one of the

key problems which prevent the sustainability of organisational growth (Normann, 2001). Understanding the value of this infrastructure after investing often proves to be an even greater challenge (Weill et al., 2002). Therefore, assessing the value of the service processes is of critical importance. Service science explores the value co-creation of interactions between service systems. As service networks continue to grow, understanding the dynamic exchange of resources which creates *value*, determined through specific relationships and interactivity (behavioural, functional, and structural) between service systems is of significant importance to the evolvement of service science.

2.3 The Problem Summary

Understanding the mechanisms and theory of managing modern service-dominant business models and processes adopted across many organisations requires significant attention in Service Science, Management and Engineering (SSME). Service Science studies the application of resources of one or more systems for the benefit of another system in economic exchange (Spohrer et al., 2007; p. 2), otherwise known as resourcing. One of the fundamental objectives of service science is to understand the mechanics of service networks and define how and why they generate value. Spohrer et al., (2007) summarises one of the core problems in understanding the dynamics and complexity of service science: "*powerful dynamics are in play around the world when it comes to applying resources effectively to solve problems and create value*" (p. 10). Value (for example, economic, social, interaction exchange, or innovation) is the core of organisational sustainability. Over the past few years business practices have changed dramatically for several reasons including; globalisation, world financial crisis, accessibility of a global educated and mobile workforce, technological advances (*'death of distance'*), and global outsourcing. Understanding how these influences have distorted our understanding of business plays a significant part on how we interpret the value of service networks and network configuration innovation. Many of these changes require that we view business with a new mindset to understand the interactions of global and electronic infrastructure which supports service operations. Transparency within service operations is envisioned as a critical factor within service innovation (Chesbrough and Spohrer, 2006). Mapping service innovation and configuration is the core objective of this research. There is little evidence to suggest the organisations understand whether their service networks are operating at an optimum level and how can they demonstrate or visualise how value is created and measured. One of the major problems, as outlined by Becker (2007), is that managers are faced with a serious issue of how to manage "*a completely invisible asset*". There is a large body of literature which suggests that social networks analysis (SNA) can present us with a unique method to model and monitor the contributory value of network actors and infrastructure (Berkowitz, 1982; Wellman and Berkowitz, 1988; Scott, 1991; Wasserman and Faust, 1994; Hassan, Hansen, 1999; 2009). Managers have ignored the "*dynamic characteristics of networks and the ways that dynamic qualities of networks affect organisations' flexibility and change*" (Cross and Parker, 2004; pp. 133). This has unavoidably led to organisations failing to understand behavioural, functional, and structural factors of a service network and overall contributory value within business processes. SNA is an approach and set of techniques which studies the exchange of resources among actors. It focuses on patterns of relations among nodes such as people, groups, organisations, or information systems and allows us to validate the value of ties and relationships between each service node to provide a visual and mathematical representation of interaction and exchanges which influence behaviour.

The main objective of this initiative is to develop a framework and a pattern toolbox to support efficient, scalable and innovative approaches to service analysis, design, implementation, and delivery. As service networks continue to evolve over the last decade, our understanding of how to discover, create, deliver, redesign, and measure the value of rearranging service process appears inadequate. Service systems are designed to provide and sustain services but often face difficulties because of their complexity and size. This presents several difficulties including interoperability, agility, and the inability to truly model dynamic service interactions and value.

One of the major issues across literature is the lack of practical methods to monitor and measure these 'invisible' service networks (for example, Buhman et al., 2005). Understanding the functionality of these networks and the challenge of managing, configuring, and co-coordinating their relationships is becoming more and more complex (for example, cloud computing). In summary, the literature indicates that there is little emphasis on service value discovery and design across service networks. Managers face serious issues in managing '*a completely invisible asset'*. This inhibits our ability to exploit and monitor large and dynamic digital and human networks.

2.4 Service Networks

In recent years there has been significant interest in our ability to effectively and efficiently manage and (re)engineer service network. To do so, we must understand what factors influences service value. Applying the service-dominant logic, organisations are beginning to move away from the traditional corporate hub of business practice

towards a more diffused and distributed web of relationships and agile alliances. Across academia and industry there is recognition for the significance of service innovation and service systems within the global 'service' economy. This is reflected in the sudden growth of service science departments and availability of service science undergraduate and postgraduate opportunities. On a practical level, understanding the functionality of these networks and the challenge of managing and co-coordinating their relationships is becoming more complex. As SSME theory is at a relatively early stage, it cannot adequately prescribe methods to manage complex service processes and their relationships. Thus, the questions emerge: how do we manage service innovation, what influences service processes, and how can we enhance their capabilities and overall business value? Understanding the value of service relationships, especially from a technological perspective can prove to be extremely problematic (Hassan, 2009). In addition, the literature indicates that the tools to create, track, and manage outsourcing business process opportunities are incompatible, slow, and difficult to use.

To provide a recent example of service system which had consequences with its inability to value and visualise the entire service network was evident with the US intelligence group, the CIA, gathering information on the Christmas Day 2009 bombing plot. US president, Barack Obama explained that "*the system has failed in a potentially disastrous way*." One of the main problems was the CIAs inability to pool information from several information services and '*connect the dots'*. This highlights how the system failed to serve a specific purpose due to the inability to connect the relationships of existing threats to security. Within an organisational setting, this prevents managers from anticipating and embracing change or polling business intelligence on service systems. SNA offers insight on the relational aspects of process interoperability which are considered more important to the sustainability of business. This is necessary as managers have learned through the economic downfall that monetary metrics are often unreliable and unsustainable in the long-term. In fact, service relationships across the globe has indicated the importance of relational ties as we witnessed the 'domino-effect' when one organisation suffered losses, it had a knock-on effect on other organisations, e.g. banks.

2.5 The Importance of Exploring Service Systems Valuing Methods?

For over the past half century the implementation of IT has served many needs throughout the business environment and evolvement of a networked infrastructure. Organisational boundaries have been redefined, creating larger 'change' patterns (Allee, 2003). Throughout literature, it is evident that IT is considered the backbone of today's business structure (Weill et al., 2002). Despite all the attention however, the contributory value of services to organisations is still poorly understood (Hassan, 2009). In recent years information requirements for organisations have dramatically changed and it has become more difficult to strategically plan for service requirements to build robust systems, hence the move towards more agile approaches (Desouza, 2007). Galliers (2007) suggests that due to the changing nature of the business environment (competitive, collaborative, and regulatory) there is a need to be more scrupulous to detail regarding the changing nature of information requirements. To exasperate this, Carr (2004) reports that although IT has been widely adopted by business, we know relatively little about what influence IT has on business performance and competitiveness of businesses. Measuring organisational performance is considered problematic due to the continuous changing environment required in today's agile business environment (Desouza, 2007).

SNA presents us with a method to understand service network strategies and the value of such strategies. It allows us to explore agile service networks as it focuses on relationships and their structural ties, rather than discrete units of analysis. Understanding the patterns adopted by certain relationships and the influence on service innovation and performance makes SNA a plausible method to explore, identify, and explain service interaction phenomena amongst network nodes and how innovation is generated within the service. This will assist managers to implement a more efficient networked web-based business process system. Cross and Parker (2004), suggest that rather than ignore the inner workings of a network and leave it to chance, managers must exploit the operation of social networks to identify '*critical disconnects*' and develop a deeper understanding of the true network value and capability of the organisation. Managers often lack the knowledge of connections or disconnections across service networks. Exploring both "*how*" and "*why"* performance can be enhanced is of significant importance in today's environment which calls for higher quality of services, improved designs, intimate customer relationships and adaptability or agility within technological applications (Hassan, 2009). The level of dimensional support across the process structures may be expressed in several forms including, structural, functional, and behavioural. Often these dimensions are taken for granted and overlooked, although this information provides both tangible and intangible metrics on agile service networks (ASN).

2.6 The Value of Agile Service Networks

Despite the volume of research which concentrates on complex business applications and modelling processes there are minimal research efforts on methods to explore the value of ASN on organisational performance (Mooney et al., 1996; Becker, 2007; Hassan, 2009). Many research suggestions on how IT supports business performance or their contribution to business value are often described as '*unreliable'*, '*impractical'*, '*anecdotal'*, or as '*PowerPoint solutions'* (Mooney et al., 1996; Highsmith, 1999; Campbell, 2000; Linder and Cantrell, 2000, Cross and Parker's, 2004; Harrison-Broninski, 2005; Chen, 2007; Krebs, 2007; Van der Aalst, 2007, Keen and Sol, 2008; Hassan, 2009). Camarinha-Matos and Afsarmanesh (2006), report that based on an analysis of past modelling efforts there appears to be a significant lack of understanding among practitioners and researchers on the "*comprehensive spectrum of suitable modelling processes, tools, and methodologies*" (p. 4). In addition, Carr (2004) reports that although IT has been widely adopted by business, we still know little about what influence IT has on business performance and competitiveness of individual business. Organisational processes and indeed their structures have become less transparent within service systems. Papazoglou, et al., (2006), reports that there is a need to understand business processes and organisational structures, with the aim to identify organisations *'pain points'* and the potential solutions that can be applied to correct them. Within the new service-dominant model, many of these pain points go undetected across service network and their partnerships. According to Cross and Parker (2004), little attention has been paid to access the effectiveness of strategic partnerships of strategic developments or to the value of their networked relationships. Thus the architecture of service networks shared amongst organisations may prove to be inefficient or often undervalued. According to Schmidt (2003), although information systems architecture supports static inter-organisational business processes, such architecture are still unavailable to support dynamic inter-organisational business processes. Business models have received increasing attention to carve off any unwanted excess cost, while still ignorant as to the value of the service system. For example, Mooney et al., (1996), suggests that "*many studies provide anecdotal evidence of the role and benefit of IT in organisational design and process improvement efforts, and others assume the existence of gain, but no empirical studies are evident"* (p. 71). This highlights the lack of understanding on service innovation (process configuration). Within the literature, Huizing et al., (1997), explores the complex relationship patterns embedded in organisational processes and as change in business reengineering are implemented, it promises greater benefits to performance. In addition, Huizing et al., (1997), reports on their evaluation of studies concerning how IT supports business performances are "*anecdotal, which often contain vague prescriptions and magic formulas*". Highsmith (1999), also argues that while new terms have been coined, such as '*empowerment'*, '*participative management'*, '*learning organisation'*, and '*human-centered management'*, none of these new concepts have encapsulated the breadth or depth, necessary to manage today's organisations. Within today's business world we witness the recent introduction of business process management, service science, and innovation management which attempts to understand the value of service networks strategies (for example, process discovery, redesign, and configuration). Galliers (2007), identifies three main problems when we discuss aligning business strategies with ICT:

1. The requirement of consistent flexibility or agility due to the dynamic nature of business
2. The failure to forecast the future and therefore the dynamic change in information requirements
3. The role in which information plays on assisting agile responses (to become proactive).

Service systems are extremely complex. Consumer demands have paved the way for increased agile needs, which means that organisations employ various technologies to meet these ad-hoc demands through innovative network structures. However, many technologies and business models are incapable of meeting dynamic requirements of today's business world, and appear to employ a continuous '*reactive'* approach, forcing organisations to compensate for technological inadequacies (Orlikowski, 1992; Doherty et al., 2003). For example, Galliers (2007), explores how IS strategies tend to focus on a rational analysis "*either in response to an extant business strategy and/or an analysis of current ICT capability*" (p. 3). Many organisations have opted to participate in a virtual value chain (service-dominant) to offer their capabilities while outsourcing other business processes. This places greater emphasis on the business model and the methods which facilitate networking contributions and value co-producers. Managers fail to visualise and understand the technical contributions to further enhance decision making tasks in relation to restructuring service business processes. In addition, managers cannot understand service capabilities.

Hassan (2009) published interesting research on '*using social network analysis to measure IT-enabled business process performance*'. Hassan (2009) demonstrates that social network analysis (SNA) can assist to answer questions such as; "*how much does IT contribute to the success of the business process?*" SNA gathers detailed insight into the workings of business processes (e.g. transactions and material resources, interaction, movement, and

evaluation of roles). SNA is a technique which is receiving increasing levels of attention across academia within numerous domains (Scott, 1991; Wasserman and Faust, 1994, Otte and Rousseau, 2002; Borgatti and Foster, 2003; Sykes 2009; Hassan 2009), and is often used to map and measure interconnecting relationships and flows between tasks, people, and technologies. Hassan (2009) demonstrates that SNA provides more robust and flexible indicators of business processes within a single organisation. However, to date, there have been no research efforts to use SNA to examine innovation (service network configuration) across ASN, i.e. complex end-to-end service interactions. Thus, this exploratory research-in-progress sets out to address this gap and examine how SNA can assist us to examine what processes influence service innovation across ASN. It presents us with the opportunity to map ASN processes across a distributed service systems, allowing us to understand and measure the behavioural patterns.

3. Service Science, Management, and Engineering

The discipline of SSME was introduced by IBM in 2002. SSME was developed to focus on several key aspects of service systems, including design and implementation of complex systems to enhance innovation and performance. A typical service encompasses the exchange the competencies or resources ('resourcing'). Services are often complex, which are normally purchased and managed by another organisations within a particular enterprise (Dietrich and Harrison, 2006). Our understanding of business practice centres on the manufacturing philosophy (goods-dominant) that an exchange infers a tangible unit of output (e.g. product, good, distribution, supply, and consumption). However, the services which contribute towards these outputs often go undetected and undervalued (Normann, 2001). This has given rise to the scientific discipline of service science. Several definitions have surfaced over its development, including Spohrer at al., (2007), service science involves "*value-coproduction configuration of people, technology, other internal and external service systems, and shared information (such as language, processes, metrics, prices, policies, and laws*)." When we refer to business process within service science, we include human processes (initiates interaction, innovation, and learning processes) and technological processes (facilitates exchanging, adapting, and evolving processes). Across academia and industry, there is a calling for the introduction of SSMED to allow managers to study, design, and implement services systems to provide definable value and benefit to all actors within a business network. However, Hsu (2009) reports that service science is at a premature stage to engage our understanding of connected value co-creation. Hsu (2009), explains that at this stage there is little emphasis on service discovery and design which has hindered our appreciation in the '*full scale of complexity of service networks'*. Within a traditional business since this may have been more acceptable as networks within supply chains were much small and therefore more 'controllable'. However, this is more problematic when applied to large complex ASN.

3.1 Service Efficiency vs. Innovation

Organisations are continuously under pressure to exercise effective and efficient business strategies which is even more evident within the current economic climate. Advocating increased efficiency within a system runs the risk of reducing the possibility of creating new organisational knowledge required to encourage innovation and agility (Galliers, 2007). Organisations continue to investigate the possibilities of a jointed effort, i.e. a distributed model towards service management across organisations (Desouza, 2007). Many of these organisations are opting to outsource core business process from IT to logistics, and finance to events, both in private and public sectors. Thus, many of the fundamental business processes are moving away from the core of the organisation, and sprinkled across a much wider global service network. This changes managers focus form long-term to short-term readjustment, configuration, and realignment tasks, which may also limit its ability to take advantage of certain situations where uncertainly arises. Galliers (2007), highlights that despite the efforts of '*best practices*' while operating business applications, they heavily rely on continuous consultancy (before, during, and after implementation) to 'mould' the solutions to 'better' fit organisational service structures and overall goals. The notion of a meeting services general needs as a business application solution can take us back to Simons (1996) concept of 'satisficing'. Simon (1996; p. 28) introduced this notion:

> *"….because real world optimising, with or without computers, is impossible, the real economics actor is in fact a satisficer, a person who accepts "good enough" alternatives, not because less is preferred to more, but because there is no choice."*

Therefore, the concept of '*satisficing'* is still prevalent within many organisations as they accept technology and performance methods as being "*good enough*" (for example, see Landry, 2008; Landry, 2009). The networked

business environment has altered our understanding of the traditional organisational structure, business transaction, and the indeed, the business model. Linder and Cantrell (2000), draw our attention to the organisational ability to change their business model to meet the dynamics of the market, although '*executives and other personnel lack the ability to converse exactly what that business model is and cannot describe it'*. The service systems which enable these business processes provide us with a blueprint or a pattern of the relationships which exist between business applications. However, understanding the value of these service networks however remains unknown. This has given rise to the concept of business process management (BPM) to monitor process performance.

3.2 Business Process Management

As the current business practices are currently carried out, we know that taking a reactive stance in today's business environment is no longer sustainable. In addition, we must also look beyond the tangible assets or goods-dominant view within business processes. According to Papazoglou (2003), a business process is "*a set of logically related tasks performed to achieve a well defined business outcome*" (p. 49). Within a service environment we are interested to learn more about the configuration of relationships (intangible metrics) which support these logical tasks. Allee (2003), cautions that many organisations find it difficult to understand many of the critical intangible metrics of organisational networks (p.5):

> *"Companies and economists struggle to develop new scorecards, metrics, and analytics that will provide leading indicators for how well a company or country is building capability for the future".*

Although Business Process Reengineering (BPR) was quickly embraced, organisations failed to reap its potential promise (Huffman, 1997). One of our latest organisational theoretical developments is Business Process Management (BPM). BPM has adopted many definitions, however DeToro and McCabe (1997), report that no single solution exists to meet organisational performance needs. The value driven metrics of BPM therefore requires further attention. Lee and Dale (1998, p. 217), offers a definition for BPM as:

> *"...a customer-focused approach to the systematic management, measurement and improvement of all company processes."*

BPM is the latest development in extending our understanding of organisational management. BPM has emerged as one of the major new developments within organisations to support our understanding of the evolution and interaction of process-oriented business applications and information systems across service networks. BPM has encapsulated many definitions over time, which identified the need to enhance a specific process or a number of processes, to allow an organisation to operate more efficiently. For example, Elzinga et al., (1995), state that BPM consists of *"...systematic, structured approaches to analyse, improve, control, and manage processes with the aim of improving the quality of products and services*." Zairi (1997), describes BPM as, *"...a structured approach to analyse and continually improve fundamental activities such as manufacturing, marketing, communications and other major elements of a company's operations".* The 'value' of BPM was captured in the Lee and Dale (1998), case study as a method of "*measuring the core processes, analysing what works and what doesn't and improving them*" (p. 219). They also identify three critical factors which contribute to the success of BPM: (1) process discipline (correct and consistent application of business processes), (2) process improvement, and (3) cross-process integration. The concept of value-driven processes often refers to services within a business network that executes a business process to produce economic value while monitoring cost, quality and time parameters within business processes. Therefore, BPM should be considered as a tool with huge potential and not a fad of managerial toolsets (DeToro and McCabe, 1997). However, according to Allee (2003), one of the main problems of successfully managing organisations today is that it has become more complex due to the changing nature (knowledge-intensive), structure (service networks) and identity of organisations. Managing the complex nature of these business relationships requires a new business mindset. If we want to manage the performance of these service networks, exploring the concept of agility across web service networks is an important step. In addition, as Carr (2004) questions the real competitive value of IT, one can interpret some abstract reference to an agile mindset as he suggests that organisations must "*resist knee-jerk specialisation and modularisation, recognising that they may undermine the complex advantages on which true long-term success is founded. Instead wise companies will use the IT infrastructure to establish business relationships that enhance, rather than diminish, their own economic and strategic power, while also providing meaningful incentives for their partners*" (Carr, 2004; p. 104). Gathering data on the health of organisational performance across a large network is very important. Organisations must attempt to shape data, information and knowledge if they want to strengthen their competitive position. However, managing data across services can be problematic. One of the major problems, as outlined by Becker (2007), is that managers

are faced with a serious issue of how to manage "a completely invisible asset". Another major issue include the overall lack of confidence amongst managers in today's business world (PriceWaterCooper, 2009).

Hepp et al., (2005), definition is more fitting when discussing business process across service networks. They report that BPM aims at, *"...providing tools and techniques that support the modelling, management, and monitoring of operations on a business process level, while automatically mapping this high-level perspective to the actual implementation being executed on the multiplicity of systems."* This definition introduces the view of a much wider network, i.e. across a number of departments or a service network which is responsible for BPM success and the co-craetion of value. Lindsay et al., (2006), introduce the ability to change and improve organisational performance and see BPM as an attempt to; *"...better understand a business's key mechanisms in order to improve, and in some cases radically change, the business performance by identifying opportunities for new business opportunities, for outsourcing, for improving business efficiency and for areas within the business where technology can be used to support business processes*". This paper adopts this view of BPM as it extends value outside of the organisation, and introduces innovative processes to improve service value and configurability. The literature indicates that the current scope of current BPM deployments are too narrow, take on an organisational-centric view of reacting to improving business functions in a single organisation, and therefore is limited to enhancing existing service business processes. Thus, organisations must pay close attention regarding the adaptability or agility of their technological infrastructure and learn what determines success within globally enmeshed organisations. Lee and Dale (1998), definition of BPM above shares close similarities to our understanding of the agile organisation, i.e. "*an innovative response to an unpredictable change*" (Van Oosterhout et al., 2007).

As more and more organisations begin to adopt an agile approach, many organisations form a collaborative network of alliances to which many business processes are reconfigured and outsourced to generate service value. Business processes are usually dynamic and consist of lengthy periods of time (e.g. negotiation) which involves process harmonisation across numerous manual and automated tasks. Business processes may also require access to several different applications and the interpretability of several application systems governed by complex business rules (Dürrschmidt and Taylor, 2007). Understanding the business logic of services systems is an initial attempt to extract key performance indicators (KPIs) and learn how we can implement a framework to govern service behaviour across ASN. Business process modelling describes the structure and behaviour of service processes (workflow, roles, rules, and regulations). T herefore, it is inevitable that companies must find new strategies and performance insights to achieve competitive advantages through BPM. One of the major emphases realised today in achieving a competitive advantage is in business intelligence (BI), through communicative and collaborative networks and knowledge management (KM) across the wider organisational spectrum, e.g. a service network (Drucker, 1988; Davenport, 2006; Ernest-Jones and Lofthouse, 2005). Wetzstein et al., (2009), explore the use of Business Activity Monitoring (BAM) to map service choreography and monitoring agreements. However, developments in BI, BPM, and BAM to enhance intangible metrics across ASN have not been very successful in the past. To assist business analysts and managers to extract knowledge, there are often a number of BI tools available (e.g. IBM Cognos 8 is a single service-oriented architecture). These are limited in their functionality (i.e. ability to extract unstructured data and limited to focus on a single organisation rather than an entire network). Pedrinaci et al., (2008), and Gottschalk et al., (2002), explains that there is an urgent need for deploying solutions capable of deriving more sophisticated insights of business processes. The ability to quickly extract accurate data from ASN presents business with more opportunity to gain competitive advantage and identify automated agile value of business processes within complex service networks.

3.2.1 IT-enabled Business Processes

Although in 1996, Mooney et al., points out that there are '*few systematic guidelines'* on how to measure the value of technology, this still appears to be the case today as organisation become more networked across service systems (for example, Hassan 2009). The importance of discovering the value of IT-enabled processes is well documented throughout the literature, for example, the introduction of "process innovation", "radical change", "process re-engineering", or what is now known as "process management" (Davenport, 1993). Today many of these concepts are captured in BPM and service innovation. There have also been a number of studies which explored IT productivity, and some have investigated the contribution of IT to organisational performance. Many of these studies look at the tangible contributions, and vary in defining the nature of IT-enabled business value, or failed to explore whether IT can in fact create value, i.e. value co-creation (for example, Brynjolfsson and Hitt, 1994; Mooney et al., 1996; Carr, 2004; Hsu, 2009). To exasperate this, as organisational physical presence become less relevant today and many opt for value co-production across a service network and measuring the business value of doing so is extremely important although becoming more problematic. It has become difficult considering the lack

of research efforts to explore the relationship value of IT-enabled processes across networked service system. Regardless of the welcomed attention of BPM as the latest development in extending our understanding of organisational management, there still appears to be a lack of a strong theoretical foundation, a lack of real-world case assessment studies, and insufficient scope on the holistic organisational processes (Harrison-Broninski, 2005). This is more evident as it explains the emergence of SSME theoretical development.

3.2.2 Business Process Modelling

From a technical perspective, service networks are made up of asynchronous flows of long-running, dynamic end-to-end service interactions which transcend across several organisations. From a managerial perspective, understanding the value of these relationships is paramount to model service performance metrics. Modelling service networks to control organisational performance proves to be a complex undertaking. Allee (2003), suggests that the idea of 'central control' which proves to have been a successful strategy in the traditional organisation (goods-dominant) is no longer sustainable, no longer practical, and is becoming less probable to control. This is mainly due to the shift in operations, i.e. what once passed through a chain of command, now disperses across networks where streams of data and information are flowing, allowing people to make decisions across the network (for example, Normann, 2001). However, monitoring KPIs may still offer a practical solution to monitor service processes.

3.2.2.1 Key Performance Indicators

Key performance indicators (KPIs) are quantifiable measures of an organisational progress to meet specific goals. KPIs also assist managers in decision making to determine the right course of action. The level of dimensional support across the process structures is expressed in several forms including, structural, functional, and behavioural. Often these dimensions are taken for granted and overlooked although this information provides both tangible and intangible metrics on organisational networks. Yang et al., (2006), identifies business service quality dimensions within organisational business process, and explores a number of transaction activities, which are summarised in table 1 below:

Table 1 Service Quality Dimensions (Yang et al., 2006)

Business Process	***Transactions Activities***	***Main Business Service Dimensions***		***Service Applications in an E-commerce Environment***
Stage 1. Information Gathering	Source and product identification & Potential supplier listed	Marketing Service	Information Service	Product information, response to questions, e-communication intermediary
Stage 2. Negotiation	Evaluate supplier & Analyse supplier quote		Communications Service	
Stage 3. Contract Fulfilment	Order, Payment, Delivery, Operations Management	Logistics Service	Order and Payment Service	Order process, Invoice, lead-time transportation details, tracking shipment, advance ship notice, Inventory transparency, response to inventory variety
			Delivery Service	
			Inventory Service	
		Operations Service	Product Service	Product quality, feature, offering, cost; Production scheduling, cycle time, capacity
			Production Service	
Stage 4. Collaboration	Collaboration Planning, Collaboration Product Development, Co-location	Collaboration Service	Product Collaboration	planning coordinator, Geographical location, additional delivery channel
			Information Collaboration	Updated information, jointed planning and forecasting

As table 1 above summarises the four main steps to deliver a business transactions and the business service dimensions are fundamental to the smooth operation of service networks. The relationships which exist between these services can determine the service innovation and operations efficiencies across networks. This will also allow us to identify the critical success factors which enable (KPI) or inhibit business processes. Papazoglou (2003), draws our attention to the focus of the current practice of business transactions, and the lack of insight into the

behaviour or the relationships of transactions between trading partners which can enhance their semantic value when transaction functions are combined. Sifting through departmental and cross-organisational conflicting objectives clutters manager's ability to extract key performance information (Glenn, 2009). Freeing up resources to develop value-added information is critical to managerial activities (e.g. rapid decision making and execution). To address these issues we must uniquely define the business KPIs. KPIs allow us to measure the success of goal achievement and to generate insight to discover how service performance and value may be enhanced. Characteristically, service network KPIs should be simple for decision making, relevant to unique (service-dominant) business models, present timely results, useful, and instant for actionable insights. Determining service behaviour involves qualitative behaviour analysis (across many dimensions such as structural, functional, and behavioural; for example, see Camarinha-Matos, 2006, pp. 11). In addition, Kaushik (2007), reports that KPIs are quiet limited in what they can present to manager or analysts for strategic direction, i.e. they present what happened. This has led to the slowly emerging concept of Key Insights Analysis (KIA). The concept of KIAs will be further explored in alignment with the research progression, i.e. how and why specific service behaviour on a network occurred. SNA will prove to be a useful methodology for KIAs.

3.3 Changing Business Landscape

In today's economic climate, the phrase "*organisational restructuring*" is rampant throughout our global economy and managerial mindsets. Organisations today are in search of a formula for success in a world that is more connected than many had believed (Friedman, 2006). Buhman et al., (2005), suggest that as organisations become more connected there are "*larger and more complex networks of R&D, manufacturing and service operations, and supply chains, covering an increasing number of countries*" (p. 502). Many of these processes amongst organisations have been 'flattened' (Friedman, 2006). To understand how 'flattened' and 'connected' our business world has become, we need only look at the evidence in which the global economic turmoil effects shifted across the world, affecting every organisation in some way or another creating a domino-like effect. Consequently, managers frequently attempts to modify business processes and workflows to accommodate for the unprecedented and accelerated rate of change. Van der Aalst (2007), advocates that 'the correctness, effectiveness, and efficiency', of business processes supported by information systems is critical for organisational survival. However, Galliers (2007), cautions that some IT developments in business applications have had a negative impact on organisational agility, by attempting to increase efficiency while reducing costs which negatively impact on agility (effectiveness, dexterity, learning, and innovation). Therefore, the perfect balance is still sought (i.e. equilibrium of business process without jeopardising performance). Ashby (1956) introduced the notion of *requisite variety* while Buckley (1976) adds that "*the variety within a system must be at least as great as the environmental variety against which it is attempting to regulate itself"*. We can take this to imply that the system (IS system) or method (agility) must have a correct balance to meet the environmental changes (organisational and consumer demands). Within a service environment, Normann (2001) advocates that we should adopt a new mindset to update the modern business model which focuses on the customer. He adds that organisational efforts are centred on the vale co-creation of business processes which deliver a service to meet customer needs.

3.4 Agile Service Networks

Agility is a concept which attempts to address some of these issues identified above. Defined by Van Oosterhout et al., (2007), agility is "*an innovative response to an unpredictable change*". It is concerned with taking greater control of unpredictable changes. Within this context, we apply agility to mean the application of innovative reconfigurability within a service network to accommodate change. From an IS perspective, Conboy and Fitzgerald (2004) offer a definition of agility as: "*the continual readiness of an entity to rapidly or inherently, proactively or reactively, embrace change, through high quality, simplistic, economical components and relationships with its environment*". Agility within an organisation is the collective ability to adapt rapidly, be cost efficient, and overall to operate as economically as possible, without jeopardising the quality of the product or service, in response to customer needs and changes in the business competitive environment. Identifying changes within service networks is critical to either prevent or encourage certain service workflows. S-Cube (2008), report that ASNs "*comprises large numbers of long-running, highly dynamic complex end-to-end service interactions reflecting asynchronous message flows that typically transcend several organisations and span geographical locations*". The sequence of message flows is a critical element of the overall transaction procedures and reflects the exchange of information between service actors across a network. Developing a framework to monitor KPIs presents us with a reusable tool to assist managers' monitor KPI behaviour within ASNs to devise a framework to support managers ability to understand service network behaviour. Baresi et al., (1999), state that the '*reusability of specifications and designs*

through pattern and framework based approaches' is becoming a critical issue (p.48). To understand the necessity to place value on networked organisation and technological infrastructures, we must begin to explore business processes through a new lens. Hassan (2009), states that performance measures today, fail to capture its '*enablers and inhibitors of process performance, dysfunctions and incongruities, activity or job fragmentation, information gaps and delays*'. However, Hassan (2009) reports that by studying IT-enabled processes, we can identify the contribution of IT to business process success, or improved performance, with little insight into "*IT-enablement*". In addition, tools to create, track, and manage outsourcing business process opportunities are incompatible, slow, and difficult to use. It is also reported throughout literature that critical business data is not properly collected, shared, standardised, or analysed to provide business intelligence. To date, we have difficulty to interpret the value of services, and unable to predict factors which effect its operations and the precise influence certain KPI has on its success. Thus, understanding when, why, and how services function best is critical to its survival.

3.5 Social Network Analysis

Social network analysis (SNA) is an approach and set of techniques which studies the exchange of resources (for example, information) among actors. SNA focuses on patterns of relations among nodes such as people, groups, organisations, or information systems (Berkowitz, 1982; Wellman and Berkowitz, 1988; Scott, 1991; Wasserman and Faust, 1994). SNA demonstrates the value of ties and relationships between each node to provide a visual and mathematical representation of interaction and exchanges which influence behaviour. Managers realise that the key to continued success is within their understanding of how workflows and business processes can be optimised (e.g. Papazoglou, 2002). Balkundi and Kilduff (2006), report that SNA may allow organisations, in financial trouble, to gain vital insights and discover survival prospects. Thus, additional focus should be placed on tailoring the business model and methods to to guide and support the processes of monitoring and mapping KPIs across ASN (system, goals, and method patterns). Kawalek and Greenwood (2000), describes an abstract model of an organisation, and how we can develop our understanding of value through the addition of three models:

1. *A model of the system*: a high level, structural view of organisational interactions (who and/or what interacts)
2. *A model of goals*: having identified patterns of interaction in the model, how can we describe the interactions (why do they take place)
3. *A model of methods*: having identified what interacts and why, a model is developed to determine why and how goals are achieved.

As outlined above, few studies explores IT interactions and its contribution towards business processes. To add a fourth step to Kawalek and Greenwood (2000) abstract model, from an agile perspective, it would be extremely useful to implement a '*model of action'*, i.e. a model which would allow us to explore strategic possibilities to simulate a 'what-if' approach to understanding the influence of each relationship across business processes. Hassan (2009), demonstrates that by studying IT-enabled processes, we can identify the contribution of IT to business process success, or improved performance. In addition, Lundqvist (2007) describes SNA as a method for detecting, describing, and analysing relationships. Another benefit of SNA is its ability to provide a methodology to gain deeper insight of how structural regularities influence behaviour (Otte and Rousseau, 2002). SNA assumes that actors (i.e. services nodes) are interconnected, with real consequences for behaviour and performance. Structures may be altered to optimise the networks outcomes. Therefore, SNA is a very fitting methodology to deploy within this research to uncover more 'truths' as to the activities and their innovation patterns within ASN.

Figure 2.1 Hierarchy of the Traditional IT Department

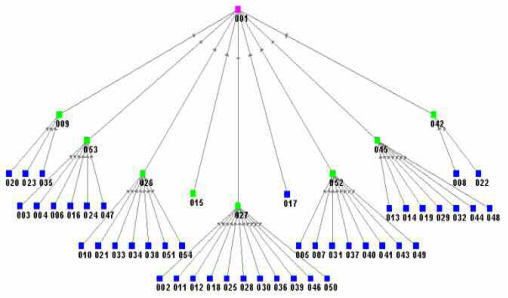

Figure 3 How Work Actually Gets Done in the IT Department

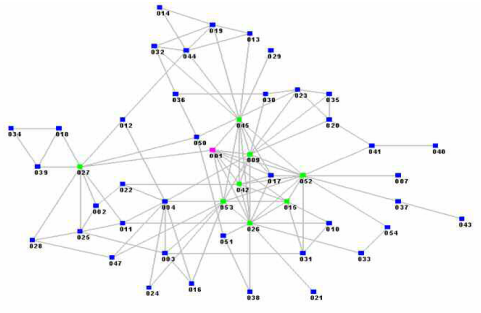

Figure 2 and 3 above (extracted from Valdis Krebs, http://orgnet.com) illustrate how SNA may be used to determine how work is carried out within an IT department. Figure 2 illustrates how managers often believe work is achieved through a hierarchical chain of events. Figure 3 illustrates how work is really accomplished. Although a simple example, the same approach may be applied to ASN to reveal service interaction and allow us to identify how KPI affects its infrastructural functionalities. Thus, organisations can gain continuous and insightful feedback on how business processes are actually being executed, and where 'gaps' or 'pain-points' may exist. This is important, as Bender-deMoll's (2008) explains that organisations vary in many ways, and not only in their size and budget available, but also in *'how well connected they are, whom they work with, and how closely integrated they are with the groups they are aiding'* (p. 2). Hassan (2009), presents a very interesting approach using SNA to analyse the interconnecting relationships of task, technologies and people. This enables research to overcome two major problems (Hassan, 2009):

1. The need to isolate and measure the impact of IT in order to plan and design how the technology should support the business process; and
2. The need to measure the success of IT-enabled BPR efforts as they are being implemented.

These approaches are also fundamental for the execution of this research. Many studies have reported the need to investigate the interaction between systems through the introduction of newly designed processes to improve organisational health.

4 Conclusion

This paper has introduces the need to fuse BPM, service innovation, and SNA to develop a management technique which can provide thorough insights on service value. It also explores the main concerns within BPM literature and provided a concise background on the state of the art literature. It successfully identifies some of the key problems, and places greater emphasis on the need to introduce methods to model the value of ASN across service networks. The expected outcome of this research is to present a concrete and practical framework which will empower managers to perform ad-hoc or continuous analysis of service business processes in ASN and allow them to model the value of service innovation. The practicality of this framework should also assist managers who are participating in a service environment, to assess, manage, or reconfigure networks. More importantly, this framework will identify the contributory value (KPIs) of participating in a specific ASN environment.

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